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### REMARKS

Favorable reconsideration of this application is requested in view of the following remarks. Claims 56 - 67 are pending in the application. Claims 1-55 have been cancelled.

#### Amendment

Editorial amendments were made to claim 56. First, the "R1 and R2 are the same or different..." language was moved to the end of the claim, as suggested by Examiner in the telephone interview of April 27, 2006. Secondly, a bond, "-" was inserted in one specie of the Markush group, where it had been inadvertently omitted.

#### 35 U.S.C. 102 rejection

Claims 56, 57, 59-61 and 63-65 were rejected under 35 U.S.C. 102(e) as being anticipated by Black et al. (U.S. Patent App. No. 2002/0022111 A). Applicants respectfully traverse. During the telephone interview with Examiner on April 27, 2006, applicants pointed out that the stabilization layer X-R of Black provides the function of stabilizing the metal magnetic particle surfaces. X (sulfinate, sulfonate, phosphinate, phosphonate, carboxylate, or thiol) attaches to the particle surfaces, and R (a hydrocarbon or fluorocarbon chain containing 8-22 carbon atoms (Black ¶ 53-54)) provide the stability because they are generally nonreactive.

As suggested by Examiner in the telephone interview of April 27, 2006, applicants are including documentary support concerning the non-reaction between the R groups of the stabilizing layer and the affinity layer of Black et al.. Specifically, §3.18 of Organic Chemistry, Third Edition, 1973, by Morrison and Boyd discusses that free radicals such as halogens must be provided or created under specified conditions of intense heat and or intense ultraviolet light to make hydrocarbons such as alkanes reactive. Additionally, §4.2 of Organic Chemistry, Third Edition, 1970, by Hendrickson, Cram, and Hammond, states that "the stability of fluorocarbons is even greater than that

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of hydrocarbons.” PTFE (commonly known by the tradename, Teflon) is a common fluorocarbon, and is well-known for its inertness.

Black et al. does not disclose, suggest, nor teach any such a method for rendering the stabilization layer reactive. In fact, Black, in ¶ 51, says that the stabilizing layer may be removed. In contrast, applicants disclose particular means, such as a high temperature heat treatment, as described in Examples 1 - 3 (*see* ¶¶ 174, 182, and 189, respectively, of the present application), for achieving the characterizing structure of the present invention, i.e., “particle-X1-R1-Y-R2-X2-substrate.” Black provides no such disclosure.

In addition, applicants point out that the first sentence of ¶ 107 of Black et al. includes the following unclear and confusing expression: “between the organic coat 6 of each ferromagnetic particle 3 and the substrate 1.” This expression could be interpreted as follows: reference numeral “6” of the “organic coat 6” would indicate an “affinity coating 6” for coating a “substrate 1,” while the “organic coat” of the “organic coat 6” would suggest an “organic stabilizer particle coating 4.” Therefore, this unclear expression renders the meaning of the first sentence ambiguous. Consequently, the meaning must be ascertained in the context of the remainder of the paragraph. With reference to the second and the third sentences of ¶ 107, it can be understood that the “affinity coating 6” forms a covalent bond to the “substrate 1” at one end thereof, and forms a covalent bond directly to the “particle 3” at the other end thereof. Accordingly, applicants think it appropriate to interpret the above-mentioned unclear expression in the first sentence as “between each ferromagnetic particle 3 and the substrate 1.” Therefore, it would be apparent for a person of skill in the art that ¶ 107 does not teach a covalent bond between the “organic stabilizer particle coating 4,” and the “substrate 1” or the “affinity coating 6.”

Furthermore, ¶ 80-82 of Black provides further support that it is the affinity coating, X-R-Y, which links the particles with the substrate, and that the stabilization layer plays no role in this bonding. The affinity coating, X-R-Y, contains “bi-functional molecules with two distinct ends: at one end is a tri-alkoxysilane group [X] (trimethoxy- and triethoxy-silanes being preferred), which will link covalently to an SiO<sub>2</sub> or metal oxide [substrate] surface. A glass substrate, or Si wafer coated with SiO<sub>2</sub>, is used. At the other end is a carboxylic acid or thiol group. These groups form strong carboxylate

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[sic] or thiolate linkages, respectively, with the metal magnetic particles. Between the two ends is a hydrocarbon chain." Therefore, since Black neither describes nor suggests the role of the organic stabilizing material (X-R) in a bond to the affinity molecule (X-R-Y) on the substrate, the applicants respectfully request that the rejection be removed.

#### Conclusion

In view of the above, early issuance of a notice of allowance is solicited. Any questions regarding this communication can be directed to the undersigned attorney,



Dated: June, 2006

Respectfully submitted,

HAMRE, SCHUMANN, MUELLER &  
LARSON, P.C.  
P.O. Box 2902-0902  
Minneapolis, MN 55402-0902  
(612) 455-3800

By: 

Douglas P. Mueller  
Reg. No. 30,300  
DPM/jll

*Third Edition*

# ORGANIC CHEMISTRY

ROBERT THORNTON MORRISON

ROBERT NEILSON BOYD

*New York University*

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BOSTON

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## 3.18 Reactions

The alkanes are sometimes referred to by the old-fashioned name of *paraffins*. This name (Latin: *parum affinis*, not enough affinity) was given to describe what appeared to be the low reactivity of these hydrocarbons.

But reactivity depends upon the choice of reagent. If alkanes are inert toward hydrochloric and sulfuric acids, they react readily with acids like  $\text{HF-SbF}_5$  and  $\text{FSO}_3\text{H-SbF}_5$  ("magic acid") to yield a variety of products. If alkanes are inert toward oxidizing agents like potassium permanganate or sodium dichromate, most of this chapter is devoted to their oxidation by halogens. Certain yeasts feed happily on alkanes to produce proteins—certainly a chemical reaction. As Professor M. S. Kharasch (p. 189) used to put it, consider the "inertness" of a room containing natural gas, air, and a lighted match.

Still, on a comparative basis, reactivity is limited. "Magic acid" is, after all, one of the strongest acids known; halogenation requires heat or light; combustion needs a flame or spark to get it started.

Much of the chemistry of alkanes involves free-radical chain reactions, which take place under vigorous conditions and usually yield mixtures of products. A reactive particle—typically an atom or free radical—is needed to begin the attack on an alkane molecule. It is the generation of this reactive particle that requires the vigorous conditions: the dissociation of a halogen molecule into atoms, for example, or even (as in pyrolysis) dissociation of the alkane molecule itself.

In its attack, the reactive particle abstracts hydrogen from the alkane; the alkane itself is thus converted into a reactive particle which continues the reaction sequence, that is, carries on the chain. But an alkane molecule contains many hydrogen atoms and the particular product eventually obtained depends upon which of these hydrogen atoms is abstracted. Although an attacking particle may show a certain selectivity, it can abstract a hydrogen from any part of the molecule, and thus bring about the formation of many isomeric products.

2. Co

Example:

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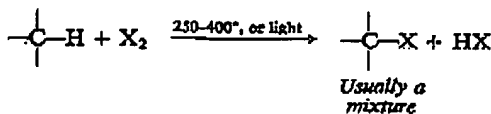
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n-But

## REACTIONS OF ALKANES

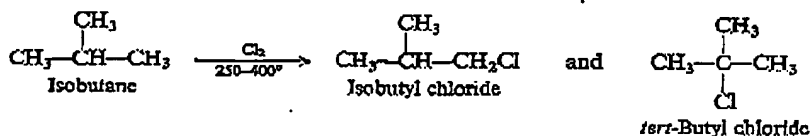
## 1. Halogenation. Discussed in Secs. 3.19–3.22.



Reactivity

 $\text{X}_2: \text{Cl}_2 > \text{Br}_2$  $\text{H}: 3^\circ > 2^\circ > 1^\circ > \text{CH}_3\text{---H}$ 

Example:

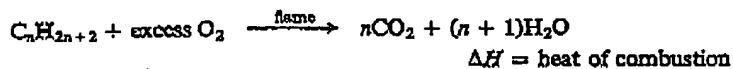


## SEC. 3.19

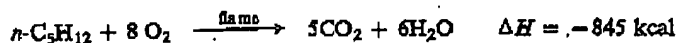
## HALOGENATION

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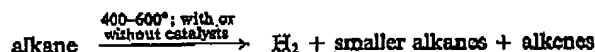
## 2. Combustion. Discussed in Sec. 3.30.



Example:



## 3. Pyrolysis (cracking). Discussed in Sec. 3.31.

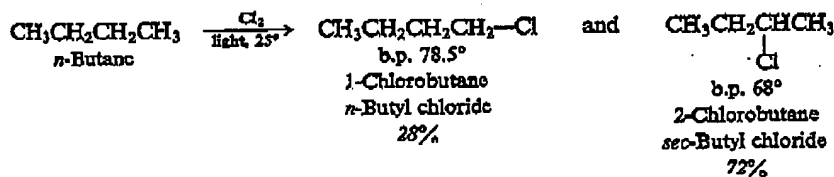
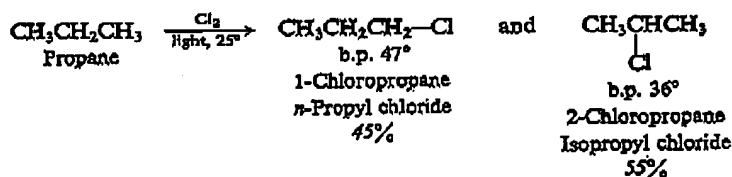
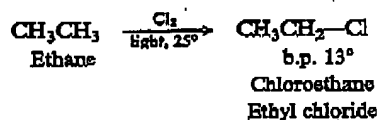


## 3.19 Halogenation

As we might expect, halogenation of the higher alkanes is essentially the same as the halogenation of methane. It can be complicated, however, by the formation of mixtures of isomers.

Under the influence of ultraviolet light, or at 250–400°, chlorine or bromine converts alkanes into chloroalkanes (alkyl chlorides) or bromoalkanes (alkyl bromides); an equivalent amount of hydrogen chloride or hydrogen bromide is formed at the same time. When diluted with an inert gas, and in an apparatus designed to carry away the heat produced, fluorine has recently been found to give analogous results. As with methane, iodination does not take place at all.

Depending upon which hydrogen atom is replaced, any of a number of isomeric products can be formed from a single alkane. Ethane can yield only one haloethane; propane, *n*-butane, and isobutane can yield two isomers each; *n*-pentane can yield three isomers, and isopentane, four isomers. Experiment has shown that on halogenation an alkane yields a mixture of all possible isomeric products, indicating that all hydrogen atoms are susceptible to replacement. For example, for chlorination:



# ORGANIC CHEMISTRY

THIRD EDITION

**JAMES B. HENDRICKSON**

*Professor of Chemistry  
Brandeis University*

**DONALD J. CRAM**

*Professor of Chemistry  
University of California at Los Angeles*

**GEORGE S. HAMMOND**

*Professor of Chemistry  
California Institute of Technology*

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**PROBLEM 4-3**

Write structural formulas for the following compounds:

- a *sec*-Butylbenzene
- b 1,2-Dimethyl-1-cyclopentene
- c Vinylacetylene
- d *syn*-Dimethylethylene
- e *p*-Methylstyrene
- f Isobutylmethylacetylene
- g Allylbenzene
- h *o*-Diethylbenzene

**PROBLEM 4-4**

Write out all possible structures that fit the following molecular formulas. Include cyclic structures only if they are aromatic. Name all compounds.

- a  $C_4H_9Cl$
- d  $C_4H_7Br$
- g  $C_8H_{18}$  (ten structures are sufficient)
- b  $C_4H_6$
- e  $C_5H_{10}$
- h  $C_{10}H_8$  (ten structures are sufficient)
- c  $C_7H_{11}$
- f  $C_6H_6$

#### 4-2 COMPOUNDS CONTAINING SIMPLE FUNCTIONAL GROUPS

The compounds to be discussed in this section are all of those containing group 1 functional groups, i.e., with only one single bond linking carbon to the heteroatom of the functional group.

##### Organic Halides

Almost any hydrogen in any hydrocarbon can be replaced with a halogen atom to give a stable compound. Since a carbon atom may be bonded to from one to four halogen atoms, an enormous number of organic halides can exist.

Completely fluorinated compounds are known as fluorocarbons. The stability of fluorocarbons is even greater than that of hydrocarbons. Completely chlorinated compounds are rather unstable if they contain more than three carbon atoms. The following examples represent interesting and important structural types:

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